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## CHINESE DRAGONFLIES (ODONATA) IN THE AMERICAN MUSEUM OF NATURAL HISTORY

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"A manual of Chinese dragonflies" by James G. Needham (1930) lists 88 genera and 266 species from China. Subsequent papers by him and by others have increased that list to close to 100 genera and well over 300 species.

In the American Museum of Natural History there are 28 genera and 35 species from China, of which only a portion were examined by Needham in the preparation of his "Manual."

Those studied and listed by him are: *Anotogaster kuchenbeiseri* Foerster, *Ictinus rapax* (Rambur), *Onychogomphus ludens* Needham (holotype), *Anax immaculifrons* Rambur, *Anax guttatus* (Burmeister), *Cephalaeschna acutifrons* Martin, *Diplacodes trivialis* (Rambur), *Diplacodes nebulosa* (Fabricius), *Orthetrum glaucum* (Brauer), *Orthetrum lineostigma* (Selys), *Neurothemis tullia* (Drury), *Sympetrum frequens* (Selys), *Trithemis aurora* (Burmeister), *Vestalis virens* Needham (holotype and allotype), *Rhinocypha drusilla* Needham (allotype), *Rhinocypha perforata* (Percheron), *Megalestes heros* Needham (paratype), *Lestes praemorsa* (Selys), *Platynemis annulata* (Selys), *Aciagrion hisopa* (Selys), and *Indoneura dolorosa* Needham (paratype).

This paper deals with those specimens which are not listed in the "Manual." It describes one new species and three neallotypes; it suppresses two species; and it adds to the distributional range of many more.

### ANISOPTERA

#### ***Chlorogomphus tunti* Needham**

Figures 1, 2, 5, 6, 9, 10

*Chlorogomphus tunti* NEEDHAM, 1930, Zool. Sinica, ser. A, vol. 11, pp. 97-98.

This species was described by Needham from a single female collected in Kwanhsien,

August 11, 1928. A single male in the American Museum has been compared with the type and is almost certainly the same species.

NEALLOTYPE MALE: Length of abdomen, including appendages, 68 mm.; appendages 3.3 mm.; hind wing 50 mm.; stigma of forewing 3.5 mm., of hind wing 4.5 mm. Width of hind wing at level of arculus 15.5 mm., at level of nodus 13 mm.

Head with eyes very narrowly separated. Labium yellow, fringed with long golden hair and with a brownish spot on either side of the median lobe; remaining mouthparts black with long, sparse, golden hair. Clypeus yellow, with a broad black band across the anteclypeus widened at the lateral margins to include the entire width of the sclerite, and with a narrow black hair line on the clypeal suture. Frons black with a bow-shaped yellow band across its crest and with a round depression covering each lateral third of the anterior surface; top of frons with long black hair. Vertex prominent, erect, and black; antennae black with a yellow ring at the base of the second segment. Triangular occiput black, elevated in the center to form a three-armed ridge and with a long erect fringe of black hair across its rear border. Rear of eyes black.

Prothorax black; anterior lobe elevated with its anterior crest margined with yellow; median lobe large, fringed with long black hair on its lateral margins; posterior lobe narrowly margined with yellow on the sides and fringed with long golden hair.

Synthorax mainly black. The black of the middorsal triangle continuous above and below with the broad antehumeral stripe, leaving a narrow yellow stripe between them; this yellow stripe club-shaped above and pointed to rearward. The black

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antehumeral connected above and below, by way of the black sinus and the black anterior half of the mesinfraepisternum, with the first lateral black stripe. This lateral stripe extends from just before the humeral suture to the level of the anterior edge of the spiracle and is marked with a small yellow spot just below the alar carina. First lateral stripe connected with the second black stripe by way of the alar carina above and the black anterior half of the metinfraepisternum below. Second lateral stripe slightly overrunning the suture in front and covering the metepimeron except for a small median yellow spot beneath the alar carina and a small yellow spot on the posterior corner which runs down on the ventral margin. Spiracle black-rimmed.

Legs black; coxae with yellow spots; anterior femora yellow on the inner side. Wings hyaline, costa and stigma black. Basal subcostal cross vein present; 23 antenodal cross veins and 13 postnodals in the forewing; 18 antenodals and 17 postnodals in the hind wing; the first and the eighth antenodals thickened; stigma of forewing surmounting three or four cross veins; one cross vein in the median space of the forewing, two in the hind; seven cross veins in the cubital space of the forewing, five in the hind; triangles with one cross vein, supratrangles with two or three; 11 cross veins before the median fork in the forewing, seven in the hind; discoidal field with two cell rows to the level of the median fork; anal triangle three-celled; anal loop of eight cells; a single row of cells between  $Cu_1$  and  $A_1$  of the hind wing.

Abdominal segment 1 black with a marginal yellow band across the apex of the dorsum and a large yellow spot on each side narrowly separated from the ventral margins. Segment 2 with sides, including the auricles, yellow, the yellow extending up to encircle the segment with a narrow ring around the median carina and a wider ring at the apex. This apical band is invaded on the middorsal line by the black of the divided shield-like spot of the dorsum. The carinae of segment 2 are black, and there is

also a small black spot on the ventral margin before the median carina and another before the apical. Basal half of segment 2 clothed with long, silky, black hair. Segment 3 with a pair of apical twin spots which meet on the middorsal line. Segments 4 to 6 with these same apical spots, reduced to narrow bands on 5 and 6 but widened on 7 to form an apical band one-fourth the segment length dorsally and one-third the segment length ventrally. Segments 8 and 9 black. Segment 10 black with a small middorsal pale spot. Appendages black; the superiors a little more than one-half as long as the inferiors and divided to almost one-half their length, the arms diverging at an angle of at least 80 degrees. Segments 4 and 5 covered with minute blunt spines, the apical fifth of segment 4 and a ring encircling the segment corresponding in position with the median carina, clear. These same spines are present on segments 5 and 6 and on the middorsal line on the basal part of 7.

TYPE MATERIAL: Neallotype, male, Mt. Omei, Szechwan Province, July, 1938 (Dean Sage, Jr.).

This male differs from the male of *nasutus* Needham in lacking the frontal prominence, in having the enlarged apical yellow ring on abdominal segment 7 instead of on segment 6, and in the greater length of the inferior appendage. The camera lucida sketches which I made of the appendages of *nasutus* several years ago show the inferior appendages in that species to be scarcely longer than the superiors, the angle of divarication of the two branches of the superiors not so great as in this species and the outer lobe of the superiors proportionately smaller. This species belongs to Fraser's Group III, *Orogomphus*, and in his key (Fraser, 1929, p. 142) resembles *atkinsoni* Selys in having only the antehumeral and the two lateral pale stripes, and differs from it in having the face black marked with yellow. It runs out to *dyak* Laidlaw on the presence of the basal subcostal cross vein and differs from it by its larger size (*dyak* hind wing is 38 mm.), the absence of the pale mesothoracic collar, and the structure of the anal appendages.

**Chlorogomphus nasutus** Needham

Figures 3, 4, 7, 8

*Chlorogomphus nasutus* NEEDHAM, 1930, Zool. Sinica, ser. A, vol. 11, p. 97.

When I first studied the holotype male of *Chlorogomphus nasutus* and the holotype female of *C. tunti* Needham in the Cornell University collection, I was of the opinion that additional material might prove them to be a single species and that the pyramidal prominence on the front of the frons of *nasutus* and the color markings of abdominal segments 6 and 7 would be found to be sexual characters. The male described above as *tunti* has disproved that belief, however, so it is a little disconcerting to find a female with the same date and locality label as this male and yet resembling the male of *nasutus* in color pattern but lacking the frontal prominence. Although apparently flying with the male of *tunti*<sup>1</sup> and although captured some distance from the type locality of *nasutus*, I ascribe it to the latter species on supposition.

**NEALLOTYPE FEMALE:** Length of abdomen, including appendages, 75 mm.<sup>2</sup>; hind wing 60 mm.; stigma of forewing 5 mm., of hind wing 5.4 mm.; width of hind wing at level of arculus 17 mm., at level of nodus 18.5 mm.

Labium yellow, median lobe crossed and bordered with brown. Face covered with stout black bristles. Labrum and anteclypeus black with a narrow yellow band on the intervening suture; postclypeus yellowish with a narrow black anterior border. Frons black with a small, bow-shaped yellow band across its summit, tapering at both ends and not meeting the lateral margins. Front of frons with a slight median swelling caused by the presence of a round depression each side. Vertex swollen behind the ocelli, erect and bilobed, black. The ocelli narrowly ringed with yellow. Occiput black, swollen anteriorly in a triangular ridge.

Prothorax black, anterior lobe with anterior margin yellow; median lobe fringed

with long black hair; posterior lobe with a pair of yellow spots.

Synthorax black, the dorsal yellow stripes narrow, clubbed above and tapering below, widely separated from the curving antehumerals which are narrow and parallel-sided above, wider below where they touch the humeral suture and then curve slightly forward. Sides black, a minute yellow spot at the center of the mesepimeron just under the alar carina, a broad yellow stripe on the first lateral suture extending below the spiracle and then narrowed abruptly to follow the curve of the anterior margin of the metinfraepisternum, a yellow spot on the metepimeron just below the carina, and an elongate spot along the posterior margin. There is a small yellow spot on the rear of each of the three infraepisterna, a yellow spot on all coxae and trochanters. The bases of the femora are pale. Wings enfumed with yellow; costa and stigma black. Basal subcostal cross vein present; 23 antenodal cross veins and 14-15 postnodals in the forewing; 17-19 antenodals and 16-17 postnodals in the hind wing; the first and the seventh or eighth thickened in the forewing and the ninth thickened in the hind wing; stigma of forewing surmounting four cross veins; two cross veins in the median space of both wings; hind wing triangle of three cells; nine cross veins in the cubital space of each wing; six cross veins in the supratrangles; 17 cross veins before the median fork, 11 in the hind wing; forewing discoidal field divides into three cell rows three cells before the median fork; anal loop of 12 cells; two rows of cells between Cu<sub>2</sub> and A<sub>1</sub> of the hind wing.

Abdominal segment 1 black with triangular yellow spots on the sides; segment 2 with this lateral yellow spot extending up along the median carina to form a median ring, and with an apical yellow ring; ventral margins of this segment covered with short black bristles; segment 3 with yellow ventral margins wider at the median carina and separated from the apical yellow ring which is interrupted on the middorsum; segment 4 with yellow ventral carina and an apical ring interrupted ventrally; segment 6 with apical band of yellow almost

<sup>1</sup> Actually, I know only that the locality labels are the same and that both are dated July, 1938.

<sup>2</sup> Segment 5 is missing; the rest of the abdomen measures 63.5 mm., and the missing segment has been estimated to be about 12 mm. in length.



interrupted on the middorsal line, one-fourth the segment length laterally; segments 7-8 with a small lateroventral apical pale spot; 9-10 and appendages black. Segment 10 is prolonged ventrally.

TYPE MATERIAL: Neallotype, female, Mt. Omei, Szechwan Province, July 12, 1923 (Dean Sage, Jr.).

### *Anotogaster sieboldii* (Selys)

*Cordulegaster sieboldii* SELYS, 1854, Bull. Acad. Roy. Belgique, ser. 2, vol. 21, p. 107; 1858, Mem. Cour. Soc. Roy. Sci. Liège, vol. 11, p. 605; 1869, Bull. Acad. Roy. Belgique, ser. 2, vol. 28, p. 202.

*Anotogaster sieboldii* SELYS, 1883, Ann. Soc. Ent. Belgique, vol. 27, pp. 115-116; FRASER, 1929, Mem. Indian Mus., vol. 9, p. 92, fig. 8, pl. 10, fig. 10.

*Anotogaster kuchenbeiseri* FOERSTER, 1899, Ann. Soc. Ent. Belgique, vol. 43, pp. 68-69; LIU, 1929, Peking Soc. Nat. Hist. Bull., vol. 3, p. 10; NEEDHAM, 1930, Zool. Sinica, ser. A, vol. 11, p. 103.

Three males, one of which was seen by Needham and listed in the "Manual" as *A. kuchenbeiseri* Foerster, run out in Needham's key to that species. Two females, which bear the same date and locality labels as two of the males, run out to *sieboldii* because of their greater size.

		HIND WING	ABDOMEN
Yenping	♂	52 mm.	66 mm.
Mt. Omei	♂	51	63
Hinghwa	♂	54	68
Yenping	♀	62	78
Hinghwa	♀	62	78

The three males have an apical pale spot on the lateral margin of abdominal segment 2, and the Mt. Omei male has, in addition, a narrow apical ring on segment 2 and apical lunules on segment 3. The Hinghwa female has a small spot in the black in front of the upper end of the second lateral suture of the thorax. The variations in the males are the same as those noted by Fraser (1929) in Foerster's *kuchenbeiseri*. This material supports Fraser's conclusions regarding the synonymy of the two species.

LOCALITY RECORDS: *Szechwan Province*: Yenping, male, female, Aug. 11, 1917 (Harry R. Caldwell); Mt. Omei, male, Aug. 13, 1938 (Dean Sage, Jr.). *Fukien Province*: Hinghwa, male, female, July-Aug. (W. B. Cole).

### *Cordulegaster luniferous* Selys

Figures 25-29

*Cordulegaster luniferous* SELYS, 1878, Bull. Acad. Roy. Belgique, ser. 2, vol. 46, p. 691; McLACHLAN, 1896, Ann. Mag. Nat. Hist., ser. 6, vol. 17, p. 364; NEEDHAM, 1930, Zool. Sinica, ser. A, vol. 11, p. 106.

*Cordulegaster pekinensis* SELYS, 1886, Compt. Rendus Soc. Ent. Belgique, ser. 3, no. 78, in Ann. Soc. Ent. Belgique, vol. 30, p. 182; McLACHLAN, 1896, Ann. Mag. Nat. Hist., ser. 6, vol. 17, p. 364; NEEDHAM, 1930, Zool. Sinica, ser. A, vol. 11, p. 105.

*Cordulegaster luniferous luniferous* FRASER, 1929, Mem. Indian Mus., vol. 9, p. 121, pl. 10, fig. 14.

*Cordulegaster luniferous pekinensis* FRASER, 1929, Mem. Indian Mus., vol. 9, p. 123, pl. 10, fig. 12.

Three specimens from Yunnan differ from Fraser's description (1929) of *luniferous luniferous* Selys in that the labrum is not bordered and crossed with black; the frons does not have a triangular blackish brown spot above but is all yellow; the prothorax is not all black but is marked with yellow; and the anal loop is of five cells. In abdominal color pattern they more closely resemble *luniferous luniferous* Selys than they do *luniferous pekinensis* Selys from which latter named variety they also differ in having a pale rather than a black occiput. The appendages show extraordinary resemblance to those of *Allogaster annandalei* (Fraser) as figured by him (1923, p. 451, as *Anotogaster*). The frons is not so high, nor is the face so broad, as in *Allogaster*.

MALE: Length of abdomen, including appendages, 0.52 mm.; appendages 2.2 mm.; hind wing 39 mm.; stigma of forewing 3 mm., of hind wing 3.8 mm.

Labium yellow, hairy. Labrum yellow, slightly more orange along the anterior border and in the median basal depression. Anteclypeus with its anterior vertical third yellow, its upper swollen two-thirds brown. Postclypeus and front of frons bright orange yellow, fringed along the sides with black hairs. Frons in front flat and cross-ridged, rising to a high sharp ridge and then sloping abruptly down to rearward; not perceptibly higher than the occiput and not much broader than the postclypeus; front surface entirely surrounded by a yellow ridge, top covered with a thick

coat of black hair; sides hairy, slightly more olivaceous. Vertex dark brownish (in one specimen black); antennae black. Occiput orange yellow, more or less horizontal in plane but rising to a triangular ridge which bears a clump of blackish brown hairs at its anterior angle, fringed with black across the rear border. Rear of occiput yellow with brown mottling.

Prothorax with anterior lobe pale brown, bordered anteriorly with black and with a darker brown median spot; median lobe pale brown, darker on the anterior border, black in the middle and on the posterolateral margins; posterior lobe black with a pair of bright yellow spots on the dorsum.

Thorax black marked with bright yellow as follows: triangles on either side of the

spot on the anterior border; metinfraepisternum black, suture broadly brown.

Legs black; femora of the hind pair brown basally and with distal brown stripes; coxae, trochanters, and femora hairy. Wings hyaline, bases golden yellow to a little beyond the first antenodal cross vein and three-fourths of the way to the arculus. Veins brown; subcosta, arculus, and nodus yellow. Discoidal triangles crossed; three cubito-anal cross veins; anal loop of five cells; anal triangle of four cells.

Abdomen with segment 1 brown; paler basally and darker apically and with a thick coat of long golden hair obscuring the pattern. Segment 2 black above with widely separated dorsal twin spots of yellow

	<i>luniferous</i>	<i>pekinensis</i>	Yunnan males	<i>annandalei</i>
Hind wing	39-41 mm.	42 mm.	39 mm.	44 mm.
Labrum	Crossed and bordered with black	Crossed and bordered with black	All yellow	Bordered with black and with median prolongation of black
Frons	Triangular black spot above	Black basal band	All yellow	Darker above
Occiput	Obscurely yellow	Black	Orange yellow	Yellow
Prothorax	Black	Black	Black marked with yellow	Black marked with yellow
Anal loop	7-10 cells	5 cells	5 cells	5 cells
Black lateral stripe of thorax	Occasionally with yellow spots	No spots	Spotted	Spotted
Distribution	Tibet (Moupin) <sup>1</sup>	Peking and Szechwan	Yunnan	Yunnan

dorsum, wider above and with outer sides nearly straight; a faint line in the depression of the upper half of the humeral suture; a broad band on the first lateral suture, not reaching the carina above and extending on the mesepimeron almost to the mesinfraepisternum, on the metepisternum ending abruptly above the spiracle; a small superior spot separated from a short narrow line below it on the center of the black of the metepisternum and followed by two minute dots, one above and one below the spiracle; a faint line in the depths of the depression of the upper two-thirds of the second lateral suture; a broad oval band on the metepimeron. Mesinfraepisternum black with a small bright yellow

just beyond the depressed median carina, and with dorsal apical twin spots, pointed basally; brown below with a yellow longitudinal band extending the length of the sides and covering the rounded auricles, interrupted at the median carina; ventral apical brown part not hairy; minute black spines along the apical carina; intersegmental membrane black. Segment 3 with the same two pairs of dorsal twin spots and with ventral margin yellowish brown, paler before the median carina; intersegmental membrane brownish. Segments 4 to 6 with the same four spots smaller, especially the apical pair; ventral margin of segment 6 slightly expanded. Segment 7 with the median pair of spots small and the apical pair mere pin pricks. Segment 8 with the

<sup>1</sup> Possibly Mupin Szechwan.

median pair of spots very bright yellow; with a lateral band along the ventral margin, expanded basally and apically. Segment 9 with the median spots more basad in position, wider and shorter, the lateral brown band covering most of the sides; region beyond the apical carina black with light markings. Segment 10 without the longitudinal middorsal carina; with an apical yellow spot each side of the dorsum and with a lateral ventral brownish band which is shining and smooth on its basal expansion. Superior appendages brownish black, paler basally; inferior appendages pale brown with a black apical superior tooth.

LOCALITY RECORD: *Yunnan Province*: Loutes-chiang, 3 males (Father A. Genestier).

### *Ictinus fallax* Selys

LOCALITY RECORDS: *Szechwan Province*: Chungking, male, July 31, 1919 (A. Warburton Davidson). *Kiangsu Province*: Shanghai.

### *Ictinus clavatus* (Fabricius)

LOCALITY RECORDS: *Szechwan Province*: Chungking, 2 females, July 31 and Aug. 8, 1919 (A. Warburton Davidson).

### *Onychogomphus ringens* Needham

Figures 13-19

*Onychogomphus ringens* NEEDHAM, 1930, Zool. Sinica, ser. A, vol. 11, p. 40, pl. 5, fig. 9.

A male from Mt. Omei, Szechwan, runs directly to *ridens* in Needham's key (1930, p. 38) because of the black cross stripe on the labrum, but its appendages agree with the figure of *ringens*. Since the female accompanying it does not have the cross stripe I think there is no doubt but that they are the latter species and that the color of the labrum is variable. The male also differs from the description of the type of *ringens* in that the spots on the sides of segments 8 and 9 are not smallish but are at least one-third of the segment's length, and that the superior appendages are all black.

NEALLOTYPE FEMALE: Length of hind wing 42 mm.; of abdomen 49.5 mm.; of stigma 5.5 mm.

Labium yellow; labrum bright orange yellow with a black anterior border and a fine black line on the clypeal suture; an-

terior clypeus yellow, black on its horizontal surface and in the lateral thirds of the suture; genae and bases of mandibles yellow; postclypeus black with a large yellow spot on the upper lateral corners; frons black with a yellow band across the bilobed crest, wider on the top than on the front but covering two-thirds of the front surface of the frons and punctuated with 10-12 black points towards the side of each bow-shaped crest; vertex black with a small yellow spot behind the ocellary ridge; ocelli yellow-ringed; antennae black with an apical yellow ring on the basal segment; occiput black with a trilobed median yellow spot continuous with the yellow of the rear and with an erect occipital horn on each side of the spot.

Prothorax black, marked with yellow as follows: a band across the anterior border of the erect anterior lobe, widened to form a spot on the median line; twin spots on the middorsal line of the median lobe and a large spot on each posterior lateral corner; a small triangular spot on the middle of the posterior border of the posterior lobe.

Dorsum of thorax black; median carina as far as the fork broadly yellow, the yellow continuous with the broad mesothoracic collar which has two minute black spots at the lower end of the carina; a pair of broad oblique yellow bands, isolated, divergent below; a small isolated spot above and a narrow curved line below just in front of the humeral suture. The black of the humeral suture is continuous below with the broad black band which covers the region between the two lateral sutures and over-spreads the second; three isolated spots occur in this black, the lowermost one quite small. Mesinfraepisternum and metinfraepisternum each with a posterior yellow spot.

Legs black; coxae and all femora broadly streaked with yellow.

Abdomen black, marked with yellow as follows: segment 1 with a middorsal spot and a broad ventral band along the sides; segment 2 with a middorsal spot extending three-fourths the segment length and with a broad lateral band not reaching the apical margin; segment 3 with twin spots fused on the median line and extending almost



to the median carina; these twin spots extend one-third the segment length on 4, one-fourth the segment length on segments 5 and 6 and more than one-half the segment length on 7. Segments 8 and 9 are black with minute lateral basal spots. Segment 10 black with a trilobed yellow spot extending across its width. Appendages yellow, tipped with brown.

This female differs from the type male in that the labrum is not crossed with black; the postclypeal spots are larger; the black band across the base of the frons is only half as wide; there is a yellow spot on the vertex and on the occiput; there is a pair of occipital horns; the yellow on the middorsal carina of the thorax extends its full length; the mesothoracic collar is complete and wider; the lateral yellow spots on abdominal segments 8 and 9 are smaller.

TYPE MATERIAL: Neallotype, female, Mt. Omei, Szechwan Province, July 17, 1938 (Dean Sage, Jr.).

**Anisogomphus flavifacies**, new species

Figures 20-24

HOLOTYPE MALE: Length of abdomen 41.5 mm.; hind wing 33 mm.; stigma 2.8 mm.

Labium yellow, median lobe broadly bordered and crossed with black. Labrum yellow with a minute impressed black dot at each lateral corner of the suture. Face all yellow. Frons gently swollen, concave above with a slight indentation on the median line, and with a black stripe across its base. Vertex black, flat; antennae black with an apical yellow ring on the first segment. Occiput flat, yellow, with a fringe of black hair, narrowly bordered with black along the anterior border and next the eyes.

Prothorax black, anterior lobe with a large yellow spot across its margin; median lobe with pale dorsal spots fused on the median line and with a large round spot on each of the shoulders; posterior lobe with a wide middorsal yellow spot; proinfraepisternum with two raised yellow spots just above each coxa.

Dorsum of thorax black, the black extending beyond the humeral suture and in a narrow line down across the lower end of

the mesepimeron, marked with yellow as follows: a small spot on the middorsal carina near its upper end, a V-shaped spot in the middle of the membrane within the crest; a pair of wide dorsal bands turned sharply to rearward at their upper ends along the line of the crest and broadly fused with the yellow collar below, the yellow of the collar narrowly interrupted on the median line; a small round spot in the depths of the humeral suture near its upper end; a narrow antehumeral band, incomplete above and at its upper end curved towards the tip of the dorsal band; a spot across the posterior half of the mesinfraepisternum. Sides of the thorax yellow, a black hair line on the lower end of the first lateral suture to just below the level of the black-rimmed spiracle; a narrow black band along the second lateral suture, continuous with the black dorsal carina above and the narrow black line across the coxa below, interrupted near its upper end.

Legs mainly black; coxae yellow with small irregular black markings; trochanter of hind leg with two external spots in line with a yellow spot and an obscure pale line on the outside of the third femora; first femora with a broad yellow band on the outside; second femora with a small yellow spot on the outside near the base; third femora with minute scattered spines and with five large, widely spaced ones on the apical half of the outer row. Wings hyaline with black veins. Stigma dorsally light yellowish brown, ventrally pale golden yellow, darker in the center. Costa yellow on its anterior margin. Basal subcostal cross vein present in all wings. Antenodals 15 in the forewing (14 and 16 in the paratypes), 10 in the hind wing (11 in the paratypes); postnodals 10-11 in the forewing (13 in the paratypes) and 10-11 in the hind wing. Arculus rising at or beyond the second antenodal cross vein, sectors widely separated. Median fork symmetrical; two or more median cross veins in the forewing;  $A_2$  in the hind wing rising under the subtriangle; anal loop of two cells (three or four cells in the paratypes); anal triangle of hind wing of three cells (four and five cells in the paratypes); three to four rows of cells behind  $Cu_2$  in the forewing; five to

six rows along the outer margin of  $A_1$  in the hind wing;  $A_1$  of hind wing with several sectors.

Abdomen mostly black, marked with yellow. Segment 1 yellow with a longitudinal black band on either side of the dorsum and with a thick furry clump of black and silver hair situated in this black; segment 2 yellow with the same two black bands on either side of the dorsum, meeting narrowly across the apex to enclose a long trilobed yellow spot on the middorsal line, and extending down on either side along the apical margin; segment 3 black with a narrow middorsal yellow band which nearly reaches the apex of the segment, a narrow yellow band each side interrupted at the median carina, and a narrow yellow line along the ventral margin; segments 4 to 7 with the narrow middorsal yellow band, interrupted by the black apical carina on 4 to 6, expanding beyond the apical carina on 7 to make a narrow transverse yellow spot; segments 4 to 7 with a basal and a median lateroventral spot, on 7 the median one enlarged and extending basally almost to the basal spot; segments 8 to 10 with a broad yellow spot the full length of each segment, covering the ventral margin and nearly one-half the sides of each segment, 8 and 9 bright yellow beyond the apical carina; segment 10 with small yellow apical twin spots on the dorsum. Appendages black. Hamule of the genitalia of the second segment roughly T-shaped and conspicuously patterned in brown and yellow.

**ALLOTYPE FEMALE:** Length of abdomen 37 mm.; hind wing 36 mm. Similar to the male; differs as follows: abdominal segment 4 has the median lateral spot extending to almost the full length of the segment but remaining narrow and sinuate; segment 8 and 9 on the sternum conspicuously bright orange marked with brown as in figure 21; vulvar scale bifid. Anal loop of three cells.

**TYPE MATERIAL:** Holotype male, allotype female, three male paratypes, female paratype, Louteschiang, Yunnan Province (Father A. Genestier).

This species seems to differ from all other species of the genus, except *A. pile* Navás, by having an all yellow face. From *A.*

*pile* it seems to differ in the color pattern of the abdomen and the color of the appendages.

### *Gomphus scissus* McLachlan

Figures 11, 12

*Gomphus scissus* McLACHLAN, 1896, Ann. Mag. Nat. Hist., ser. 6, vol. 17, p. 367.

*Gomphus scissus* NEEDHAM, 1930, Zool. Sinica, ser. A, vol. 11, p. 62.

A single female specimen from Mupin, Szechwan, shows a remarkable resemblance to the description of *Gomphus edax* Needham but differs from it in the presence of a median occipital horn, a bright yellow spot on the rear of the occiput, and the greater approximation of the two lobes of the vulvar scale. Doctor Needham writes me that a line of text has been omitted from the original description of *edax* and that the third sentence of that description should read: "The top of the head is black with a V-shaped ridge upon the middle of the vertex and a stout erect black horn on the low occipital border, with a thin fringe of black hairs on either side."<sup>1</sup>

Needham was not familiar with McLachlan's species *scissus*, knowing it only from the original description which he transcribed for use in his "Manual." I have not seen *scissus* either, but I am convinced that the specimen before me now is that species and I am inclined to believe that *edax* may also prove to be the same, although the vulvar scale of this specimen, perfectly described by McLachlan, is scarcely reconcilable with that figured for *edax*. An examination of the McLachlan description shows that the yellow spots on the occiput, a character used by Needham in his key, are on the rear of the occiput and that the face is all black. The yellow at the corners of the mouth no doubt refers to the yellow on the bases of the mandibles. The apparent differences in color pattern of the thorax in *scissus* and *edax* are due, I think, to a misinterpretation of McLachlan's description. He describes the yellow collar and crest and then says "behind these is an oblique band on either side of the dorsal crest and a small isolated spot

<sup>1</sup> The italicized words are those omitted from the original text.



below each band placed more outwardly." I rather think he was holding his specimen upside down and was referring to the spots which I describe below as being the small, antehumeral superior spots. McLachlan also refers to a line on the interalar suture. Needham interprets that as corresponding to his second lateral suture and so describes the sides as yellow with a black line on the middle suture. I think McLachlan's interalar suture is the same as Needham's third lateral and that the black stripe is placed as in *edax*.

**FEMALE:** Length of abdomen 39.5 mm., hind wing 35 mm., stigma of forewing 3.5 mm.

Lips and face shining black, a brown area on the center of the anteclypeus, a broad yellow band across the top of the frons, and a bright yellow spot at the base of each mandible. Base of frons black; vertex black; antennae black with a broad apical yellow ring on the first segment. Occiput black with a broad yellow spot across the back, rising to a point at the rear of the median horn; median occipital horn rising from the anterior face of the occiput.

Prothorax black; anterior lobe with anterior margin broadly yellow; median lobe with median twin spots of yellow separated by a hair line of black, a large yellow spot on each lateral margin, and a small yellow spot in the front of each lateral black area; posterior lobe obscurely yellow across the dorsum of the posterior border.

Dorsum of thorax black, marked with yellow as follows: a very fine line on the crest, a mesothoracic collar separated at the median carina a pair of dorsal stripes divergent downward and isolated, a small antehumeral superior spot on each side. Sides of thorax yellow, the black of the dorsum overspreading the humeral suture and connected above and below with the black stripe on the second lateral suture (Needham's third) and with the widely interrupted stripe on the first lateral suture. This black on the first lateral suture extends a little above the spiracle and includes it. Mesinfraepisternum and metinfraepisternum black with a large yellow spot on their ventral posterior margins.

Coxae and legs black. Wings enfumed;

costa and veins black; stigma dark brown. Basal subcostal cross vein in one wing; 14 antenodals and 11 postnodals in the forewing; anal loop of two cells.

Abdomen black, marked with yellow as follows: a middorsal band, narrow on the base of segment 1 and then expanded to form a wide dorsal spot which is continued in an apical half ring; on segment 2 narrower, trilobed; on segment 3 narrow on the basal fourth and then continued as a hair line along the middorsal carina; on segment 4 forming a narrow basal triangle covering one-fourth of the segment length, continuing in a middorsal hair line, slightly wider on the apical third; on segments 5 to 7 the same basal triangle and middorsal hair line; segments 8 to 10 all black, the intersegmental membranes of 8 and 9 pale. A lateral yellow band covers the sides of segments 1 and 2 to the ventral margin; on 3 narrower, not reaching the margin, interrupted at the median carina and extending only three-fourths of the segment length. Ventral carinae of 8 and 9 yellow. Appendages black with a yellow dorsal spot.

**LOCALITY RECORD:** *Szechwan Province:* Mupin, female, Aug. 19, 1938 (Dean Sage, Jr.).

### *Anax parthenope* Selys

These specimens all have the hind wing well over 50 mm. in length and therefore do not run out in Needham's key to this species.

**LOCALITY RECORDS:** *Szechwan Province:* Chungking, female, Aug. 31, 1919 (A. Warburton Davidson); Wanh sien, 3 males, female, Sept. 13, 1921 (Third Asiatic Expedition); Mt. Omei, female, Aug. 14, 1938, (Dean Sage, Jr.). *Yunnan Province:* Kunming, male, Sept. 5, 1945, West Mt. (J. R. Fowler).

### *Hemianax ephippiger* Burmeister

**LOCALITY RECORD:** *Szechwan Province:* Liangnoku, July 4, 1938 (Dean Sage, Jr.).

### *Gynacantha subinterrupta* Rambur

**LOCALITY RECORD:** *Szechwan Province:* Chungking, female, Aug. 12, 1919 (A. Warburton Davidson). *Fukien Province:* Yenping, male, female, Sept. 29, 1917 (Harry R. Caldwell).

### *Planaeschna milnei* Selys

**LOCALITY RECORD:** *Fukien Province:* Yenping, male, Sept. 28, 1917 (Harry R. Caldwell).

**Cephalaeschna acutifrons** Martin

LOCALITY RECORD: *Fukien Province*: Yenping, 2 females, Aug. 20, 1917 (Harry R. Caldwell).

**Cephalaeschna lugubris** Martin

This specimen differs from Needham's description and figure, though only slightly. The labrum is shining black except for the anterior yellow border; the front of the frons is shining black except for its anterior yellow border; the occiput is black with two yellow spots. In addition to the yellow triangle at each end of the broad lateral thoracic black band there is an intermediate chain of yellow spots in the black. The tips of the appendages are more sharply hooked downward and the apical third is not so strongly elevated.

LOCALITY RECORD: *Szechwan Province*: Mt. Omei, male, Aug. 15-20, 1938 (Dean Sage, Jr.).

**Cephalaeschna magdalena** Martin

LOCALITY RECORD: *Szechwan Province*: Mt. Omei, 4 males, female, Aug. 15-20, 1938 (Dean Sage, Jr.).

**Aeschna melanictera** Selys

LOCALITY RECORD: *Szechwan Province*: Mt. Omei, male, female, Aug. 15-20, 1938 (Dean Sage, Jr.).

**Orthetrum albistylum** (Selys)

LOCALITY RECORDS: (Series) *Szechwan Province*: Chungking, Aug. 2, 1919 (A. Warburton Davidson); Lushan, Aug. 7, 1938 (Dean Sage, Jr.); Mt. Omei, Aug. 21, 1938 (Dean Sage, Jr.); Wanhhsien, Sept. 28, 1921 (Third Asiatic Expedition); Yachow, Sept. 2, 1938 (Dean Sage, Jr.). *Fukien Province*: Hinghwa, July-Aug. (W. B. Cole); Yenping, Sept. 8, 1917 (Harry R. Caldwell). *Yunnan Province*: Kunming, male, Sept. 5, 1945, West Mt. (J. R. Fowler).

**Orthetrum internum** McLachlan

LOCALITY RECORD: *Yunnan Province*: Louteschiang, 2 males, female (Father A. Genestier).

**Orthetrum lineostigma** (Selys)

LOCALITY RECORD: *Fukien Province*: Yenping, male, June 30, 1917 (Harry R. Caldwell).

**Orthetrum neglectum** (Rambur)

LOCALITY RECORDS: *Szechwan Province*: Yachow, male, Sept. 3, 1938 (Dean Sage, Jr.); Yuitung, 3 males, Aug. 11, 1938 (Dean Sage, Jr.).

*Yunnan Province*: Louteschiang, 3 males, female (Father A. Genestier).

**Orthetrum sabinum** (Drury)

LOCALITY RECORDS: *Szechwan Province*: Mt. Omei, 2 males, July 17, 1938 (Dean Sage, Jr.); Wanhhsien, 5 males, Sept. 12-15, 1921 (Third Asiatic Expedition). *Fukien Province*: Fuchow, 9 males, May 5, 1917 (C. R. Kellogg); Yenping, male, female, Aug. 10-17, Sept. 8, 1917 (Harry R. Caldwell).

**Orthetrum testaceum** (Burmeister)

LOCALITY RECORDS: *Szechwan Province*: Wanhhsien, male, Sept. 15, 1921 (Third Asiatic Expedition). *Fukien Province*: Yenping, 3 males, female, Aug. 14, 1917 (Harry R. Caldwell).

**Orthetrum melanium** (Selys)

The males from Mupin are smaller than the others, the hind wing measuring, respectively, 35, 36, 37, and 43 mm. The forewing triangles are of three cells, and there are four rows in the discoidal field.

LOCALITY RECORDS: *Szechwan Province*: Mt. Omei, female, Aug. 14, 1938 (Dean Sage, Jr.); Mupin, 2 females, 4 males, July 25-29, 1938 (Dean Sage, Jr.); Yinching, male, Sept. 28, 1938 (Dean Sage, Jr.). *Fukien Province*: Yenping, 3 males, May 29, Aug. 28, Sept. 8, female, July 23 (Harry R. Caldwell). *Kwangtung Province*: Hongkong, male, Sept. 22, 1920, Peak Hotel (H. E. Crampton).

**Rhyothemis variegata**

Linnaeus and Johansson

LOCALITY RECORDS: (Series) *Szechwan Province*: Yenping, Aug. 30, 1917 (Harry R. Caldwell). *Kwangtung Province*: Canton, Sept. 23, 1920 (H. E. Crampton).

**Palpopleura sexmaculata** Fabricius

LOCALITY RECORDS: *Szechwan Province*: Chungking, Aug. 9, 1919 (A. Warburton Davidson). *Fukien Province*: Hinghwa, 2 males, female, July (W. B. Cole); Yenping, Sept. 8 (W. B. Cole). *Kwangtung Province*: Canton, female, Sept. 22, 1920 (H. E. Crampton).

**Crocothemis servilia** Drury

LOCALITY RECORDS: (Series) *Szechwan Province*: Wanhhsien, Sept. 13, 1921 (Third Asiatic Expedition); Chungking, Aug. 15, 1919 (A. Warburton Davidson); Yachow, Aug. 14, 1938 (Dean Sage, Jr.); Mt. Omei, July 18, 1938 (Dean Sage, Jr.); Futsing, July 10, 1916 (Roy Chapman Andrews). *Kwangtung Province*: Canton, Sept. 22, 1920 (H. G. Crampton).

**Sympetrum croceolum Selys**

LOCALITY RECORDS: *Szechwan Province*: Wanshien, male, Sept. 15, 1921 (Third Asiatic Expedition). *Fukien Province*: Yenping, female, July 21, 1917 (Harry R. Caldwell).

**Sympetrum darwinianum Selys**

LOCALITY RECORD: *Szechwan Province*: Wanshien, Sept. 13, 1921 (Third Asiatic Expedition).

**Sympetrum erroticum ardens McLachlan**

LOCALITY RECORDS: (Large series) *Szechwan Province*: Chungking, Aug. 5, 1919 (A. Warburton Davidson); Mt. Omei, Aug. 15-20, 1938 (Dean Sage, Jr.); Wanshien, Sept. 14, 1921 (Third Asiatic Expedition); Yinching, Sept. 1, 1938 (Dean Sage, Jr.). *Fukien Province*: Hinghwa, July-Aug. (W. B. Cole); Yenping, May 25, July-Aug. (Harry R. Caldwell); Fuchow (W. B. Cole).

**Neurothemis fulvia Drury**

LOCALITY RECORDS: *Fukien Province*: Fuchow, large series, Aug. 17, 1914 (C. R. Kellogg, W. B. Cole).

**Pantala flavescens Fabricius**

A large series from all localities.

**Tramea chinensis DeGeer**

LOCALITY RECORDS: *Szechwan Province*: Wanshien, male, female, Sept. 22; Chungking, 4 females, Aug. 4-15, 1919 (A. Warburton Davidson); Yinching, 3 females, Sept. 1, 1938 (Dean Sage, Jr.). *Fukien Province*: Yenping, 3 males, 2 females, Sept. 8-11, 1917 (Harry R. Caldwell).

**Tholymis tillarga (Fabricius)**

LOCALITY RECORD: Formosa (Souter).

**ZYGOPTERA****Agrion atratum (Selys)**

LOCALITY RECORD: *Szechwan Province*: Chungking, large series, Sept. 1-12, 1919 (A. Warburton Davidson).

**Agrion oberthurii McLachlan**

LOCALITY RECORD: *Szechwan Province*: Lushan, male, July 18, 1938 (Dean Sage, Jr.).

**Matrona basillaris Selys**

LOCALITY RECORDS: *Szechwan Province*: Tatsienlu, 3 females, July 14, 1938 (Dean Sage, Jr.); Lushan, male, July 8, 1938 (Dean Sage, Jr.); Mt. Omei, male, female, May 25, 1938, male, female, June 23, 1938 (Dean Sage, Jr.);

Yachow, male, female, July 14, 1938 (Dean Sage, Jr.). *Hupei Province*: Ichang Gorge, male, female, June 1921 (Third Asiatic Expedition); Peking, 5 males, 2 females, Aug. 7, 1921 (Third Asiatic Expedition). *Fukien Province*: Fuchow, male (W. B. Cole); Hinghwa, 4 males, 9 females, July-Aug. (W. B. Cole).

**Archineura incarnata (Karsch)**

The appendages of this specimen differ slightly from the figure in Needham's "Manual" (pl. 16, fig. 1) in that the inferiors from the dorsal aspect become approximated before the superiors.

LOCALITY RECORD: *Szechwan Province*: Lushan, male, July 18, 1938 (Dean Sage, Jr.).

**Neurobasis chinensis (Linnaeus)**

LOCALITY RECORD: *Fukien Province*: Fuchow, pair (C. R. Kellogg).

**Vestalis virens Needham**

LOCALITY RECORD: *Szechwan Province*: Tailong, male, female, July 24-25, 1938 (Dean Sage, Jr.).

**Pseudophaea decorata (Selys)**

LOCALITY RECORD: *Hupei Province*: Ichang Gorge, male, June, 1927.

**Bayadera bidentata Needham**

LOCALITY RECORD: *Szechwan Province*: Mt. Omei, 2 males, Aug. 20, 1938 (Dean Sage, Jr.).

**Rhinocypha perforata (Percheron)**

LOCALITY RECORD: *Fukien Province*: Yenping, 2 males, June 14, Sept. 28, 1917 (C. R. Kellogg).

**Caliphaea confusa Selys**

The inferior appendages of these specimens differ from those shown by Needham (as *C. consimilis*) in that they are broad at the base, slender in the apical third with the tip turned like a stout crochet hook.

LOCALITY RECORD: *Szechwan Province*: Mt. Omei, 3 males, female, July 15-20, 1938 (Dean Sage, Jr.); Yinching, male, Sept. 2, 1938 (Dean Sage, Jr.). *Yunnan Province*: Louteschiang, large series (Father A. Genestier).

**Megalestes distans Needham**

Identification of these specimens cannot be certain since the tips of the male abdomens are missing.



**LOCALITY RECORD:** *Szechwan Province:* Tatsienlu, 2 males, 2 females, July 14, 1938 (Dean Sage, Jr.).

**Mesopodagrion tibetanum** McLachlan

**LOCALITY RECORD:** *Yunnan Province:* Loutes-chiang, large series (Father A. Genestier).

**Platynemism annulata** Selys

The superior appendages of these specimens have upturned tips.

**LOCALITY RECORD:** *Szechwan Province:* Mupin, male, July 19, 1938 (Dean Sage, Jr.).

**Pyrrhosoma tinctipennis** McLachlan

**LOCALITY RECORD:** *Yunnan Province:* Loutes-chiang, 2 males (Father A. Genestier).

**Agriocnemis pygmaea** Rambur

**LOCALITY RECORD:** Formosa (A. Souter).

**Agriocnemis femina** Brauer

**LOCALITY RECORD:** *Fukien Province:* Fuchow, 2 males (C. R. Kellogg); Yenping, male, July 20, 1917 (Harry R. Caldwell).

**Agriocnemis lacteola** Selys

**LOCALITY RECORD:** *Fukien Province:* Yenping, male, June 20, 1917 (Harry R. Caldwell).

**Aciaagrion hisopa** Selys

**LOCALITY RECORDS:** *Szechwan Province:* Wanhhsien, 2 males, 2 females, Sept. 15, 1921, 4 males (Third Asiatic Expedition). *Fukien Province:* Fuchow, female, May 5, 1917 (W. B. Cole).

**Ceriagrion melanurum** Selys

**LOCALITY RECORDS:** *Szechwan Province:* Chungking, 2 males, Aug. 17, 1919 (A. Warburton Davidson); Failiu, male, Aug. 19, 1921 (Third Asiatic Expedition); Mupin, 4 males, 3 females, July 22-29, 1938 (Dean Sage, Jr.); Tailing, 3 males, female, Aug. 24-25, 1938 (Dean Sage, Jr.); Yachow, male, July 14, 1938 (Dean Sage, Jr.); Wanhhsien, 5 males, Sept. 12-15, 1921 (Third Asiatic Expedition). *Fukien Province:* Hinghwa, 3 males, female, July 7; Yenping, male, July 16, 2 males, Sept. 6-9, 1917 (Harry R. Caldwell); Fuchow, 2 females, May 5, 1917 (W. B. Cole).

**Ceriagrion erubescens** Selys

**LOCALITY RECORD:** *Szechwan Province:* Mupin, 3 males, July 25, 1929 (Dean Sage, Jr.).

**Coenagrion** species

One male, with the tips of the appendages gone, answers the description of *sauteri* Ris except that the fine brown lines in the second and third lateral sutures are extremely abbreviated.

**LOCALITY RECORD:** *Szechwan Province:* Wanhhsien, male, Sept. 15, 1921 (Third Asiatic Expedition).

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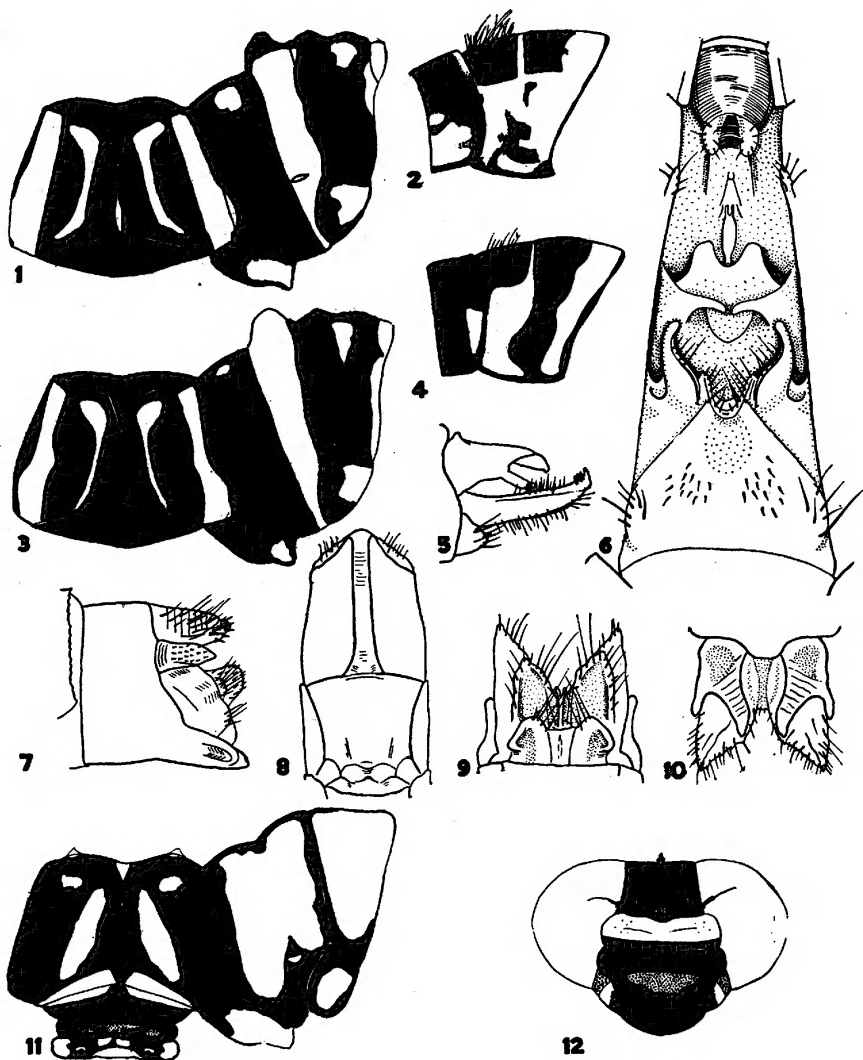
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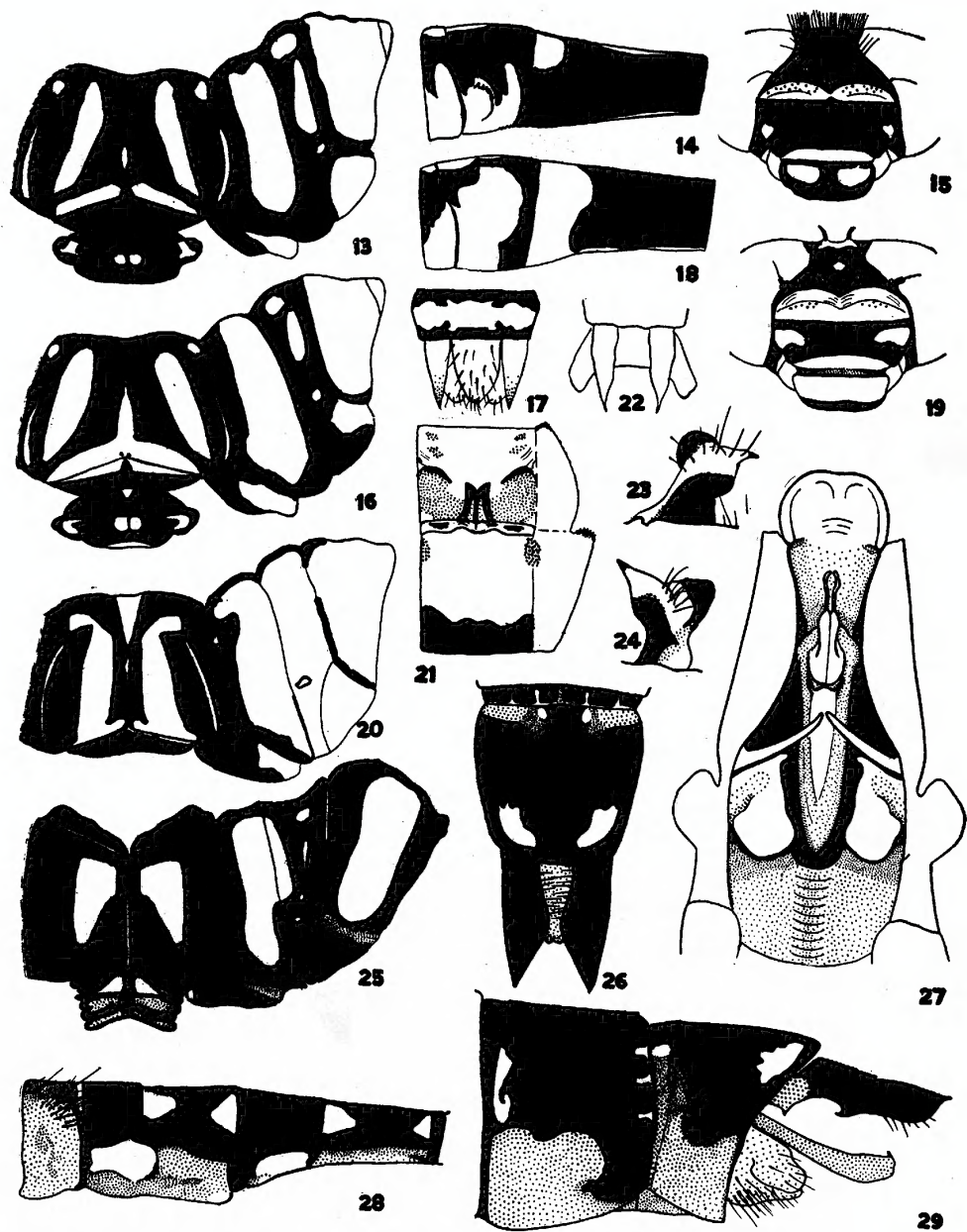
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- Fig. 1. *Chlorogomphus tunti* Needham, male, diagram color pattern, thorax.  
 Fig. 2. *Chlorogomphus tunti* Needham, male, diagram color pattern, first two abdominal segments, lateral view.  
 Fig. 3. *Chlorogomphus nasutus* Needham, female, diagram color pattern, thorax.  
 Fig. 4. *Chlorogomphus nasutus* Needham, female, diagram color pattern, first two abdominal segments, lateral view.  
 Fig. 5. *Chlorogomphus tunti* Needham, male, abdominal appendages, lateral view.  
 Fig. 6. *Chlorogomphus tunti* Needham, male, genitalia, second segment, ventral view.  
 Fig. 7. *Chlorogomphus nasutus* Needham, female, abdominal appendages, lateral view.  
 Fig. 8. *Chlorogomphus nasutus* Needham, female, abdominal segments 9-10, ventral view.  
 Fig. 9. *Chlorogomphus tunti* Needham, male, abdominal appendages, ventral view.  
 Fig. 10. *Chlorogomphus tunti* Needham, male, abdominal appendages, dorsal view.  
 Fig. 11. *Gomphus scissus* McLachlan, female, diagram color pattern, thorax.  
 Fig. 12. *Gomphus scissus* McLachlan, female, diagram color pattern, face.





- Fig. 13. *Onychogomphus ringens* Needham, male, diagram color pattern, thorax.  
 Fig. 14. *Onychogomphus ringens* Needham, male, diagram color pattern, first three abdominal segments, lateral view.  
 Fig. 15. *Onychogomphus ringens* Needham, male, diagram color pattern, face.  
 Fig. 16. *Onychogomphus ringens* Needham, female, diagram color pattern, thorax.  
 Fig. 17. *Onychogomphus ringens* Needham, female, anal appendages, dorsal view.  
 Fig. 18. *Onychogomphus ringens* Needham, female, diagram color pattern, first three abdominal segments, lateral view.  
 Fig. 19. *Onychogomphus ringens* Needham, female, diagram color pattern, face.  
 Fig. 20. *Anisogomphus flavifacies*, new species, male, diagram color pattern, thorax.  
 Fig. 21. *Anisogomphus flavifacies*, new species, female, abdominal segments 8-9, ventral view.  
 Fig. 22. *Anisogomphus flavifacies*, new species, male, anal appendages, dorsal view.  
 Fig. 23. *Anisogomphus flavifacies*, new species, male, hamule, inner view.  
 Fig. 24. *Anisogomphus flavifacies*, new species, male, hamule, outer view.  
 Fig. 25. *Cordulegaster luniferous* Selys, male, diagram color pattern, thorax.  
 Fig. 26. *Cordulegaster luniferous* Selys, male, abdominal segment 10 and anal appendages, dorsal view.  
 Fig. 27. *Cordulegaster luniferous* Selys, male, genitalia, second abdominal segment, ventral view.  
 Fig. 28. *Cordulegaster luniferous* Selys, male, diagram color pattern, first three abdominal segments, lateral view.  
 Fig. 29. *Cordulegaster luniferous* Selys, male, abdominal segments 9-10 and anal appendages, lateral view.

